

Appln No. 10/724,313
Amdt date December 20, 2005
Reply to Office action of September 20, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A displacement device for producing a rotary movement, comprising:

a drive element[.,,];

an output element which can be adjusted in angle by the drive element[.,,];

a load torque lock which is mounted between the drive element and the output element and which blocks torque introduced from the output element on an output side through force-locking engagement and transfers torque introduced from the drive element on a drive side to the output element, wherein the load torque lock includes rigid locking elements, and

a play compensating device which compensates a torsion angle play between the drive element, the output element and the load torque lock, wherein the play compensating device is located at least one of between the drive element and the load torque lock and between the output element and the load torque lock[.,,]; and

at least two locking elements with expanding faces;

wherein the drive element has a wedge slide guide;

wherein the play compensating device has at least one wedge with wedge faces and a wedge guide, the wedge mounted between the expanding faces of the at least two locking elements with the wedge faces set opposite the expanding faces of the locking elements and guided displaceable with the wedge guide in positive locking engagement in the wedge slide guide of the drive element and pretensioned radially by means of a spring so that the wedge faces adjoin the expanding faces free of play;

wherein a matching of materials of the expanding faces and the wedge faces on one side and active faces of the wedge guide and wedge slide guide of the drive element on the other side

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is such that in the absence of any drive torque the expanding faces can move the wedge against the action of the spring and that in the event of strain on the drive side the wedge is held in position; and

wherein α is the wedge angle which the wedge faces include between themselves, $\sigma_{\text{sper},\text{min}}$ is the minimum friction angle, $\sigma_{\text{sper},\text{max}}$ is the maximum friction angle between the wedge faces and the expanding faces, $\sigma_{\text{antr},\text{min}}$ is the minimum friction angle between the wedge guide and the wedge slide guide and the following conditions are met

$$2 * \sigma_{\text{sper},\text{max}} < \alpha$$

$$\sigma_{\text{antr},\text{min}} + \sigma_{\text{sper},\text{min}} > \alpha/2$$

in which $\sigma = \arctan \mu$ and μ is the friction value between the friction faces formed from expanding faces and the wedge faces in the case of $\sigma_{\text{sper},\text{max}}$ and $\sigma_{\text{sper},\text{min}}$ and the active faces of the wedge guide and wedge slide guide in the case of $\sigma_{\text{antr},\text{min}}$.

2. (Currently Amended) The displacement device according to claim 1, wherein: the ~~load torque lock has at least two~~ locking elements are mounted in a cylindrical displacement housing, the at least two locking elements each having clamping faces which adjoin the displacement housing under the effect of the play compensating device, such that torque introduced by the output element intensifies the bearing contact of the locking elements against the displacement housing .

3. (Currently Amended) The displacement device according to claim 2 wherein~~[[:]]~~
~~the at least two locking elements have opposing expanding faces and~~ the expanding faces are opposing expanding faces, and the play compensating device is mounted at least in part between the opposing expanding faces and presses the locking elements apart with such force that the clamping faces of the locking elements adjoin the displacement housing with predetermined pretension.

4. (Previously Presented) The displacement device according to claim 2 or 3 wherein:

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the play compensating device is guided in the drive element and is connected to a spring which pretensions the play compensating device in a play compensating direction.

5. (Previously Presented) The displacement device according to claim 2 wherein:
the at least two locking elements are biased with a pretensioning force against a play compensating direction.

6.-8. (Cancelled)

9. (Withdrawn) The displacement device according to claim 8 wherein:
the wedge guide is arranged radially off-set from the expanding faces of the locking elements.

10. (Withdrawn) The displacement device according to any of the preceding claims 6 to 9 wherein:

the expanding faces of the locking elements or the wedge faces are formed ball-shaped.

11. (Withdrawn) The displacement device according to claim 1 wherein:
the locking elements have expanding faces which are one of flat or ball-shaped, and
the play compensating device has at least one of a cylindrical shaped roller or a ball mounted between the expanding faces of the locking elements, with the one of a roller or ball having a guide mounted in a slide guide of the drive element and having its outer surface adjoining against the flat or ball-shaped expanding faces of the locking elements .

12. (Withdrawn) The displacement device according to claim 1 wherein:
the locking elements have expanding faces, and
the play compensating device has at least one eccentric mounted rotatable between the expanding faces of the locking elements and formed as a stepped bolt mounted with an eccentric pin in a bore of the drive element and pretensioned radially by a torsion spring so that the eccentric faces adjoin the expanding faces of the locking elements without play.

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13. (Withdrawn) The displacement device according to claim 12 wherein:

the eccentric faces have one of a shape or surface quality, such that the eccentric faces adjoin the expanding faces of the locking elements and the eccentric pin is connected with the drive element so that when the drive element is operated the eccentric is blocked and does not impede the movement of the locking elements .

14. (Withdrawn) The displacement device according to claim 1, comprising two pairs of locking elements mounted in superimposed planes in the axial direction of the load torque lock of the displacement device for both rotary directions of the displacement device, and comprising a drive element formed as a follower disc having radial opposing slits for holding the play compensating device .

15. (Withdrawn) The displacement device according to claim 14 wherein:

the follower disc has slide guides and the locking elements have recesses with wedge-shaped stop faces,

the play compensating device has two wedges with wedge guides and wedge faces, the wedges being arranged in the slide guides of the follower disc and in recesses of the locking elements, wherein the wedge guides of the wedges are mounted in the slide guides of the follower disc and the wedge faces on each side adjoin wedge-shaped stop faces of the recesses of the superposed pairs of locking elements and in the event of radial displacement in the slide guides of the follower disc exert a force acting circumferentially on the locking elements .

16. (Withdrawn) The displacement device according to claim 15 further comprising locking element springs which couple the locking elements of a first plane with the output element, wherein: the locking elements of the first plane each have an output side with stop faces and the stop faces on the output side of the locking elements press against locking element springs which couple the locking elements of the first plane with the output element.

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17. (Withdrawn) The displacement device according to claim 14 further comprising an output axis, wherein:

the locking elements have expanding faces with stops on the expanding faces,
the play compensating device has wedges with wedge faces, the wedges mounted radially displaceable on the follower disc, and has scissor arms mounted rotatable about the output axis, the scissor arms have radial stops adjacent to the displacement housing, and spread apart by the wedge faces of the wedges to adjoin the stops on the expanding faces by their radial stops.

18. (Withdrawn) The displacement device according to claim 17 wherein:

the scissor arms have contact bearing faces and the wedges have a center axis such that an angle between the contact bearing faces of the scissor arms and the center axis of the wedges create a self-locking action between the wedges and the follower disc .

19. (Withdrawn) The displacement device according to claim 17 or 18 wherein:

the angle including the wedge faces of the wedges and the surface quality of the wedge faces and the bearing faces of the scissor arms create no self-locking action between the wedges and the scissor arms .

20. (Withdrawn) The displacement device according to claim 14 comprising a wedge with a wedge guide, wherein:

the follower disc has a slide guide and a radial surface quality of one of the wedge guide of the wedges and the slide guide of the follower disc assists in the self-locking action.

21. (Withdrawn) The displacement device according to claim 17 wherein:

the scissor arms have contact bearing faces which are formed convex at least in part and adjoin flat or convex wedge faces .

22. (Withdrawn) The displacement device according to claim 14 further comprising an output axis, wherein the play compensating device has wedges and spring elements moving the wedges in the direction of the output axis .

23. (Withdrawn) The displacement device according to claim 22 wherein:

the wedges have end faces facing the displacement housing and the spring elements are formed from compression springs which are mounted between the displacement housing and the end faces of the wedges facing the displacement housing .

24. (Withdrawn) The displacement device according to claim 22 comprising two diametrically opposing wedges with end faces opposite the displacement housing and wherein:

the spring elements are yoke or formed springs which engage with angled ends in recesses at the end faces of diametrically opposing wedges.

25. (Withdrawn) The displacement device according to claim 22 wherein:

the spring elements are wire springs whose ends are supported in one of recesses of the wedge faces and fastenings of the wedges .

26. (Withdrawn) The displacement device according to claim 1 comprising a rod-like drive element, a hollow cylindrical output element enclosing the rod-like drive element, two pairs of locking elements in superposed planes of the load torque lock mounted between the output element and the displacement housing in each plane, spring elements mounted between expanding faces of the locking elements in each plane and bringing the clamping faces of the locking elements both to bear against the displacement housing and through rotation of the locking elements in the displacement housing, the locking elements bear against contact bearing points of the output element, a wedge whose wedge faces adjoin the expanding faces of the locking elements which are opposite the expanding faces adjoined by the locking element springs wherein the wedge has a bore or recess in which the drive element is pushed, and a spring pretensioning the wedge against the expanding faces of the locking elements .

27. (Withdrawn) The displacement device according to claim 26 wherein:

by selecting one of the wedge angle, the spring constant of the spring and the friction index between the expanding faces of the locking elements and of the wedge the wedge faces

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adjoin the expanding faces of the locking elements so that there is no self-locking action between the locking elements and the wedge .

28. (Withdrawn) The displacement device according to claim 1 wherein:

the drive element has claws which with torque on the drive side after lifting the friction locking contact of the locking elements against the displacement housing engage with positive locking connection into recesses of the output element and entrain this in the drive direction.

29. (Previously Presented) The displacement device according to claim 2 wherein:

the drive element has recesses which adjoin with keyed connection against claws of the output element and entrain the output element in the drive direction in the event of torque on the drive side after lifting friction-locking contact of the locking elements against the displacement housing .